AN
ESSAY
ON
SLEYING-TABLES.

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AN

ESSAY

ON

THE CONSTRUCTION

OF

SLEYING-TABLES:

OR,

An Attempt to illuſtrate *geometrically* the fundamental Principle of the Art of Weaving.

By Robert Barbour.

Eſt modus in rebus: ſunt certi denique fines
Quos ultra, citraque nequit conſiſtere rectum. Hor.

Anon. 1428

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PREFACE.

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THE importance of the art of weaving is abundantly evident from its ſubſerviency in ſupplying the wants, and affording the conveniencies, of human life; and from its contributing largely to the commercial intereſt of every STATE, in which it meets with proper culture and encouragement. An attempt, therefore, to illuſtrate the leading principle of this uſeful art ſeems to ſtand in no great need of an apology.

But as the neceſſities of mankind muſt have given it a very early riſe; and as it has, for many ages, been practiſed by vaſt numbers in every civilized nation, it is natural enough to think, that, long before this period, every thing relative to the weaving art has been maturely conſidered, and thoroughly underſtood.

There is, however, no diſputing againſt fact. The writer of the following Essay was bred to the weaving buſineſs, and has purſued it, with ſome attention, for upwards of twenty years; and yet, notwithſtanding the moſt ſolicitous enquiry during the courſe of his practice, he could never learn that any ſuch thing had ever appeared, as *an approved, univerſal* canon *for the conſtruction of* SLEYING TABLES †: nay, he found it to be the generally received opinion, that ſleying was reducible to no rules, and that the knowlege of it was only to be acquired by practice and experience.

BUT to this opinion our Author never could ſubſcribe. He was perſuaded, that, how difficult ſoever it might be to come at, ſome RULE or other certainly exiſted, that would invariably anſwer in every poſſible caſe: the words of HORACE, which he has aſſumed for his motto, came frequently a-croſs his mind; and ſleying became, now and then, the ſubject of his *reveries.* The reſult of theſe reveries is what is here preſented to the reader.

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† For the meaning of this, ſee the following ESSAY.

As the ESSAY proceeds methodically upon the well-known principles of MATHEMATICS, Geometers may eaſily ſatisfy themſelves with reſpect to *the juſtneſs of the theory:* and as the author gives a table calculated according to the rule preſcribed by the ESSAY, that table is a fair appeal to EXPERIENCE; and any diſcerning tradeſman may quickly diſcover, that, ſo far as he can collate them, *the table and ſound practice very notably coincide.* I ſay, *ſo far as he can collate them;* for the practical ſkill of any one individual is but narrow and reſtricted, extending, at furtheſt, to a few caſes, in two or three branches of manufacture: whereas the applicableneſs of the table is univerſal and unconfined.

But, perhaps, it may be objected, that the Essay is by no means adapted to thoſe for whom it ought to have been intended: for though MANUFACTURERS are allowed to be a ſagacious enough ſet of men, they are, generally ſpeaking, not very well acquainted with abſtract ſpeculations; and but little converſant in geometry and algebra, or even with extracting of roots.

To this it is anſwered, That it is pity that the mathematics ſhould be ſo little regarded in the education of thoſe who are deſigned for the mechanic arts; eſpecially ſuch of them as have a tolerable genius, and a little money to begin the world with: for, as that demonſtrative ſcience has for its object whatever is capable of being *meaſured* or *numbered;* as it contemplates number and meaſure *abſtractly*, with their various relations and analogies; and as number and meaſure are ſpecies of quantity, which, in *every art*, ought carefully to be attended to; was mathematical learning to be more generally cultivated, greater improvement in the arts might reaſonably be expected, and this objection to the Essay would fall to the ground.

In the mean time, however, the Essay is not without its uſe. There are in the world great numbers of valuable ſeamen who have dexterity enough to circumnavigate the globe; and who, at the ſame time, underſtand little or nothing about the conſtruction of *ſines*, *tangents*, and *ſecants*, with which, in every ordinary trip, they have ſo much to do: but as tables of ſines, *etc.* are calculated upon principles that are demonſtrably certain; navigators, of all ſorts, proceed upon them in full confidence, and with abſolute ſecurity. What a table of *natural* ſines is to trigonometry and navigation, ſuch is our Author's table with reſpect to the weaving art; and the demonſtration, upon which his table is founded, is given in the Essay, with what conciſeneſs and perſpicuity he happened to be maſter of: and it will be admitted, he preſumes, that the difficulties which *ſome* may labour under, in tracing the inveſtigation, can neither affect the certainty of its concluſion, nor the utility of the invention.

Upon the whole; if the Author has ſtumbled upon any thing that ſhall prove *aiding* to the induſtrious, or *gratifying* to the inquiſitive, the reflection will give him pleaſure. At any rate, he has the pleaſure of having ſatisfied himſelf: and to ſatisfy himſelf was his *primary* aim in making the enquiry.

It remains to be obſerved, that the following little *Tract* would, probably, never have ſeen the light, had it not been for the incitement of a noted clergyman in England, who is very well known to the world, by his public-ſpirited performances.

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IN the following Essay references to authorities are purpoſely omitted. To thoſe who are acquainted with the elements of Geometry, ſuch references would be ſuperfluous; and to all others, an idle, unmeaning parade.

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ESSAY

On the CONSTRUCTION of

SLEYING-TABLES.

IN a weaving proceſs, thoſe threads which are ſtretched upon the loom, and paſſed through its various tackling, are termed WARP.

THE tranſverſe threads, which, together with the former, compoſe the *plexus*, are named WOOF, or WEFT.

IT is the buſineſs of the MASTER-WEAVER to ſelect proper yarns for both. It is his province to determine what number of threads the warp ſhall conſiſt of; and how they are to be diſpoſed in the loom,—whether more ſparſely,—or more compactly; as may beſt ſuit, in his apprehenſion, the flimſy or ſubſtantial fabric of the intended cloth.

TO inſert the weft with a ſhuttle; and to keep the warp-threads in repair, during the operation, is the JOURNEYMAN's employment.

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THE diſpoſing of the warp-threads in the loom is termed SLEYING; as the utenſil, by means of which it is performed, is named a SLEY, from its office to *ſeparate* or *divide*: that utenſil, however, is not unfrequently called a REED; becauſe the ſplits or partitions in it, which are parallel to each other, and equidiſtant, like the teeth of a comb, are uſually made from the ſplinters of reeds, or ſmall canes.

WHEN a tradeſman has any how learned what reed is proper for making a piece of any one ſort of cloth from yarns of a certain fineneſs, he may, no doubt, proceed ſecurely in ſleying yarns of the ſame ſize, in the ſame manner, for cloth of the ſame fabric: and, perhaps, he will run no great riſk in making choice of reeds for yarns that are a little finer, or a little coarſer; for though he errs, the error, in thoſe caſes, will probably be ſcarce diſcernible. But if, for the ſame ſort of cloth, he ventures to ſley yarns that are widely different in point of fineneſs, there will be the greateſt hazard of his miſſing the fabric which he aimed at; and the higheſt probability that the miſtake will then become glaringly conſpicuous. Thus a maker of linens, from four to five ſhillings per yard, however much he may excell in his own way, will be apt to blunder egregiouſly if he tries to make a piece of cloth of a ſimilar fabric, at eight pence, or ten pence per yard: and it *muſt* be ſo; *whilſt the* ratio, *which ſubſiſts between yarns and reeds, lies undiſcovered.* This hitherto has been the caſe; and hence the ingenious manufacturer, in every attempt out of his ordinary way, finds himſelf entirely given up to doubtful conjecture, and random experiment: and, in his moſt ſucceſsful efforts, he is utterly deſtitute of that inward ſatiſfaction which ever accompanies a ſcientific perception of the reaſon of things.

To throw a little light upon an uſeful, but neglected, ſubject; to ſupply a manifeſt defect in the weaving art; and thereby to facilitate the progreſs of manufactures, in a country which greatly needs their aid, is, profeſſedly, the deſign of the following pages.

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'A RIGHTLY CONSTRUCTED SLEYING-TABLE is a ſcheme which exhibits the proper reeds for diſpoſing warp-yarns, of every given degree of fineneſs, in ſuch a manner, that (due regard being had to the quality, and inſertion of the weft) all the cloths, produced from thoſe different warps, ſhall be exactly ſimilar in fabric or compacture.'

In order to compoſe ſuch a ſcheme for any one ſpecies of cloths, the following *data* are previouſly requiſite.

1. The number of the reed, employed

in making the cloth, the fabric of which is intended for the model.

2. THE fineneſs of the warp-yarn of ſaid cloth. And,

3. THE fineneſs of the warp, the reed for which is ſought.

BY the number of the reed is underſtood the number of ſplits, or rather of the intervals of the ſplits contained in a given dimenſion; without having any regard to the number of thoſe intervals that may in fact have been occupied by the warp: for the reed is preciſely the *ſcale* by which the diſtance between the threads of the warp is regulated; and it equally affects the fabric of the cloth, whether the breadth of the cloth be a yard, or an inch.

The comparative fineneſs of any two parcels of yarn may be aſcertained by the number of threads, of a determinate length, contained in a given weight of the one, compared with the number of threads of the ſame length, contained in the ſame weight of the other; due regard being always had to the degree of compreſſion which the maſs of each receives in the ſpinning. For, if two parcels of equal weight, but of different fineneſs, be ſpun from the ſame materials, and the degree of compreſſion be preciſely the ſame; the threads in both, like all other cylinders of equal ſolidity, will reciprocate their baſes and altitudes: in proportion as the baſe of the one thread is diminiſhed, *i. e.* as it becomes finer than the other; the altitude will be increaſed, *i. e.* it will become longer than the other: and if the threads of both parcels be wound up in convolutions of equal circumference, there will be a greater number of thoſe convolutions in the one parcel than in the other, in proportion as the one is finer than the other: and the two baſes will be to each other inverſely as the lengths of the threads. Thus, if the number of convolutions in the coarſer parcel be a, and the number in the finer be b; the baſe of the coarſer will be to the baſe of the finer, $b : a$; or, $\frac{1}{a} : \frac{1}{b}$.

But the parcel that has the greater

$a = 1.$ = Convolutions in a given Lt of Coarse Thread
$b = 4.$ = Do ——— of Fine Thread

number of convolutions, in a given weight, will have its thread *more* compreſſed by the action of the ſpinning-wheel, than the parcel which has the leſs number in the ſame weight. How this comes about falls to be explained a little.

Every country-girl knows, that, in making yarns, for like purpoſes, and from the ſame materials, her wheel muſt be oftener turned round in ſpinning a finer thread of a given length, ſuppoſe a yard of the parcel *b*, than in ſpinning a coarſer thread of the ſame length, ſuppoſe a yard of the parcel *a*. The reaſon is this: all yarns that are ſpun from the ſame materials, and deſtined to like purpoſes in manufacture, how different ſoever they may be with reſpect to fineneſs, ought to be *equally hard*, or *equally ſlack* in the twine: that is to ſay, the fibres, which compoſe their ſurfaces, ought to be twiſted to the *ſame degree* of tenſion. Now, as the two threads of the parcels *a* and *b* are ſuppoſed to have been ſpun from the ſame materials; if they are likewiſe ſuppoſed to be deſigned for ſimilar purpoſes, they ought *ſo to be twiſted*, as that the ſuperficial fibres of both may become *equally tenſe;* theſe of the one, with thoſe of the other. But the periphery of the baſe of the finer thread being leſs than the periphery of the baſe of the coarſer; the ſuperficial fibres of the finer will be leſs ſtretched by a given number of circumgyrations than the ſuperficial fibres of the coarſer thread will be by the ſame number:

and in order to give the ſame degree of tenſion to the ſuperficial fibres of the finer thread with that of the ſuperficial fibres of the coarſer; the number of circumgyrations muſt be increaſed, by how much the periphery of the baſe of the finer is leſs than the periphery of the baſe of the coarſer.

However, though the ſuperficial fibres of the finer thread, in receiving the ſame degree of tenſion with thoſe of the coarſer, require a greater number of circumgyrations; that greater number will be effected by a *leſs* force than what is needful to produce the leſs number which the coarſer thread requires. In other words, the ſuperficial fibres of the finer thread, taken together, will be ſtretched to any *given* degree, by a *leſs* force than what is needful to ſtretch the ſuperficial fibres of the coarſer thread, taken together, to the *ſame* degree. For the ſuperficial fibres of the two threads are evidently as the ſurfaces of the two threads: and in order to give them the ſame degree of tenſion, the forces applied to them ought to be in the ſame *ratio*. Now, as the two threads are of the ſame length, and the baſe of the finer thread leſs than the baſe of the coarſer, its periphery, and therefore its ſurface, will be leſs than that of the coarſer; and the force, required to give its ſuperficial fibres the ſame degree of tenſion with thoſe of the coarſer will likewiſe be leſs. Thus the two threads being of the ſame length, their ſurfaces, omitting the baſes, will be as the peripheries of their baſes; and the peripheries of their baſes are as the diameters of their baſes; and their baſes are as the ſquares of their diameters: therefore, the ſurfaces of the two threads will be as the ſquare roots of their baſes. But their baſes are to each other, upon the ſuppoſition of an equal compreſſion, $\frac{1}{a} : \frac{1}{b}$; their ſurfaces will then be, and the forces employed againſt them ought to be, $\sqrt{\frac{1}{a}} : \sqrt{\frac{1}{b}}$: and as $\frac{1}{b}$ is leſs than $\frac{1}{a}$, the $\sqrt{\frac{1}{b}}$ will be leſs than the $\sqrt{\frac{1}{a}}$, as has been ſaid.

BUT although the force applied to the ſurface of the finer thread, in the ſpinning, be leſs than what is applied to the ſurface of the coarſer; the finer will be *more com-*

preſſed than the coarſer. For while the compreſſing forces diminiſh and increaſe in the *ratio* of the ſurfaces of the threads, *i. e.* in the *ratio* of the peripheries of their baſes, and conſequently in the *ratio* of their diameters; the maſſes of the threads diminiſh and increaſe in the *ratio* of their baſes, *i. e.* in the *duplicate ratio* of their diameters: the force, then, which is applied to the ſurface of the finer thread, though leſs than what is applied to the ſurface of the coarſer, will bear a greater proportion to the maſs upon which it acts, than the force which acts upon the coarſer bears to the maſs of the coarſer. The finer thread, therefore, being ſubjected to a force proportionally greater than that which affects the coarſer thread, will be *more ſtrongly compreſſed* than the coarſer; and become more denſe, and leſs bulky, *i. e.* finer, by how much its maſs is more diminiſhed than the compreſſing force which is employed againſt it.

It appears, then, that two things are to be regarded in aſcertaining the comparative fineneſs of a yard of the parcel *a*, and a yard of the parcel *b*; the *maſs* of each, and the *force* applied to the ſurface of each, in the ſpinning. As the threads are of equal lengths, their maſſes will be as their baſes; and the forces applied to them are as the peripheries of their baſes, or as the diameters of their baſes reſpectively: the two threads will therefore be to each other in a *ratio* compounded of the *ratios* of

a = 4 = Weight or Base of the Coarse Thread
b = 1. = Base or Wt of same Length Fine — 5'

theſe two. Thus their baſes being, forces equal or apart, $\frac{1}{a} : \frac{1}{b}$; and the forces, $\sqrt{\frac{1}{a}} : \sqrt{\frac{1}{b}}$; the coarſer thread will be to the finer, $\frac{1}{a}\sqrt{\frac{1}{a}} : \frac{1}{b}\sqrt{\frac{1}{b}}$.

These things being premiſed, the queſtion to be diſcuſſed is ſimply this:—If yarn, the number of which in a given weight is *a*, and conſequently its fineneſs $\frac{1}{a}\sqrt{\frac{1}{a}}$, be properly ſleyed, for any one ſort of cloth, in a reed, the number of which upon a given dimenſion is *c*; in what reed, of the ſame dimenſion, ought yarn to be ſleyed, for cloth of the ſame fabric, the number of which, in the ſame weight, is *b*, and its fineneſs $\frac{1}{b}\sqrt{\frac{1}{b}}$?

Here, for the preſent, let it be admit-

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ted, that the yarn, the fineneſs of which is $\frac{1}{a}\sqrt{\frac{1}{a}}$, is ſleyed by one thread only in each interval of the reed *c*; and that the yarn, the fineneſs of which is $\frac{1}{b}\sqrt{\frac{1}{b}}$, is to be ſleyed in the ſame manner: and let it further be allowed that the intervals of the reed *c* are ſo exactly commenſurate to the threads $\frac{1}{a}\sqrt{\frac{1}{a}}$, that each thread is touched upon both ſides by its neighbouring ſplits, without being preſſed by them, and thereby deprived of its cylindrical form. Theſe things granted, each interval of the reed *c* will be equal to the diameter of the circular baſe of the cylindrical thread contained in it. Now, as circles are to each other as the ſquares of their diameters; ſo, *vice verſa*, the ſquare of the diameter of one circle will be to the ſquare of the diameter of another circle, as the one circle is to the other. But the circular baſes of the two threads are, $\frac{1}{a}\sqrt{\frac{1}{a}} : \frac{1}{b}\sqrt{\frac{1}{b}}$; and an interval of c, or $\frac{1}{c}$, is equal to the diameter of a thread $\frac{1}{a}\sqrt{\frac{1}{a}}$; therefore the ſquare of $\frac{1}{c}$ * will be to the ſquare of an interval of the reed ſought, $\frac{1}{a}\sqrt{\frac{1}{a}} : \frac{1}{b}\sqrt{\frac{1}{b}}$. Or, to expreſs it in the alternate way,

$$\frac{1}{a}\sqrt{\frac{1}{a}} : \frac{1}{c}^2 :: \frac{1}{b}\sqrt{\frac{1}{b}} : \frac{1}{x}^2.$$

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* Here it is preſumed, that the thickneſs of each of the ſplits, in the one reed, is to the thickneſs of each of thoſe, in the other, *inverſely* as the number of ſplits, in the one, to the number of thoſe in the other.

The ſtricteſt regard is due to this proportion in making reeds for the ſame ſorts of cloth; as otherwiſe, the beſt ſcheme of ſleying, that can be deviſed, will, in many inſtances, be rendered impracticable.

EACH interval, then, of the reed x will be equal to the diameter of a thread $\frac{1}{b}\sqrt{\frac{1}{b}}$ in the ſame manner that an interval of c is equal to the diameter of a thread $\frac{1}{a}\sqrt{\frac{1}{a}}$. And if it ſhould be ſuppoſed, that an interval of c is commenſurate to two, three, four, or any given number of threads $\frac{1}{a}\sqrt{\frac{1}{a}}$; it will follow, that an interval of x will be equally commenſurate to the ſame number of threads $\frac{1}{b}\sqrt{\frac{1}{b}}$.

AND if an interval of c, equal to the diameters of a given number of threads $\frac{1}{a}\sqrt{\frac{1}{a}}$, have only a part of that number ſleyed into it; and an interval of x, equal to the diameters of the ſame number of threads $\frac{1}{b}\sqrt{\frac{1}{b}}$, have the like part of that number ſleyed in it; the empty ſpace in the interval *c* will be to that of the interval *x*, as the one interval is to the other: and the occupied ſpace in the one will be to the occupied ſpace in the other, in the ſame *ratio*: and the empty ſpace in the interval *x* will be to the thread, or threads, contained in that interval, as the empty ſpace in the interval *c* is to what is contained in it.

In like manner, if there be ſleyed into an interval of *c* a greater number of threads $\frac{1}{a}\sqrt{\frac{1}{a}}$ than that interval is equal to the diameters of; and an equal number of threads $\frac{1}{b}\sqrt{\frac{1}{b}}$ be ſleyed into an interval of *x*; the threads in the interval *c*, will be to the threads in the interval *x*, as the one interval is to the other: and the exceſs in the one will be to the exceſs in the other in the ſame *ratio*: and the exceſs in the interval c, will be to the threads in the interval c, as the exceſs in the interval x is to the threads in the interval x.

HENCE, if yarn $\frac{1}{a}\sqrt{\frac{1}{a}}$ be high-ſleyed, or thick-ſet in the reed c; the yarn $\frac{1}{b}\sqrt{\frac{1}{b}}$ will be ſo likewiſe in the reed x: if the former be low-ſleyed, or thin-ſet; ſo will the latter: and, univerſally, whatever the fabric of the cloth made from the one is, ſuch will the fabric of that made from the other be; ſo far as the fabric of cloth depends upon the ſleying of its warp.

THE method, however, which obtains

here, in SCOTLAND, of coming at the comparative fineneſs of yarns, is not by taking the number of convolutions in a given weight; but by—what amounts to the ſame thing—the weight of a given number of convolutions. For inſtance; a ſpyndle, which, in this country, is the higheſt denomination of yarn, contains 5760 convolutions of two yards and an half in circumference; or, to uſe the common phraſe, 5760 threads, ten quarters of a yard in length. Now, if a ſpyndle weighs a pound; to ſay that it does ſo, is, in effect, the ſame as ſaying that there are 5760 threads in a pound. Again, if another ſpyndle weighs a quarter of a pound; with reſpect to this ſecond, to ſay that a ſpyndle is equal to a quarter of a pound;

or that a pound contains four times the number of threads of this yarn that it does of the former, comes to the ſame thing. And, no doubt, it is much eaſier in aſſorting any conſiderable quantity of yarn, to weigh it by half, or even by quarter, ſpyndles; and then to claſs the different parcels according to their reſpective weights *, than it would be, firſt to divide the quantity into pounds; and then — ſit down, and count the number of threads in each pound; and after that — to range the ſeveral parcels according to the number of threads in the pound. But then, this eaſier method varies the ſtate of the terms,

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* This ſuppoſes that every ſpyndle has its full tale: and, indeed, partly owing to wiſe regulations, and partly to national honeſty, there is little ground of complaint here.

as well as the terms themſelves, in aſcertaining the comparative fineneſs of yarns; and conſequently varies the operation in finding the value of x. For, as in any two yarns, that are ſpun from the ſame materials, the number of threads in a given weight, of the one, is to the number of threads in the ſame weight, of the other, *inverſely* as the baſes of the threads, abſtract from their compreſſion; ſo the weight of a given number, of the one, is to the weight of the ſame number of threads, of the other, *directly* as their baſes. This is evident from the example juſt now given: there it is ſeen that a pound contains four times the number of the finer yarn that it does of the coarſer; at the ſame time, a ſpyndle of the coarſer is four times the weight of a ſpyndle of the finer. And, in every caſe, as threads of the ſame length and denſity have their maſſes in the *ratio* of their baſes; ſo, *e contra*, their baſes will be in the *ratio* of their maſſes. Now, as the two ſpyndles are ſpun from the ſame materials; their maſſes will be as their weights: and as they are of the ſame length, their baſes will be in the *ratio* of their maſſes, *i. e.* in the *ratio* of their weights: and as the compreſſing force, applied, in the ſpinning, to the ſurfaces of threads, of the ſame length, is in the *ratio* of the ſquare root of the maſs; and the maſs is as the weight; the two ſpyndles will be to each other *directly* as their weights into the ſquare roots of their reſpective weights. Thus, if the weight of a ſpyndle of yarn be *d*, the number of which in a pound is *a*; and the weight of another ſpyndle be *e*, the number of which in a pound is *b*; the comparative fineneſs of the two is equally aſcertained by ſaying, that the coarſer is to the finer, $d\sqrt{d} : e\sqrt{e}$; or, $\frac{1}{a}\sqrt{\frac{1}{a}} : \frac{1}{b}\sqrt{\frac{1}{b}}$. In either caſe, the value of x will turn out to be the ſame—whether the queſtion be ſtated *inverſely*, as the *numbers*; or *directly*, as the weights. The following TABLE, however, in compliance with the general practice, is adapted to the *weights*: and the ſymbolical numbers, in it, are ſo conſtructed as to make it a very eaſy matter, upon proper *data*, to calculate ſleying-tables for cloths of every *poſſible* fabric.

THE

Oz. dr. per Spy.	Symbols of Reeds	Oz. dr. per Spy.	Symbols of Reeds.
2 - 0	595	6 - 0	261
2 - 4	544	6 - 8	245
2 - 8	503	7 - 0	232
2 - 12	468	7 - 8	221
3 - 0	439	8 - 0	210
3 - 4	413	8 - 8	200
3 - 8	391	9 - 0	192
3 - 12	371	9 - 8	185
4 - 0	354	10 - 0	178
4 - 4	338	11 - 0	166
4 - 8	324	12 - 0	155
4 - 12	311	13 - 0	146
5 - 0	300	14 - 0	138
5 - 8	278	15 - 0	131

TABLE.

Lib. oz. per Spy.	Symbols of Reeds	Lib. oz. per Spy.	Symbols of Reeds.
1 - 0	125	3 - 8	49
1 - 2	114	3 - 12	46
1 - 4	106	4 - 0	44
1 - 6	98	4 - 4	42
1 - 8	92	4 - 8	40
1 - 10	87	5 - 0	37
1 - 12	82	5 - 8	35
1 - 14	78	6 - 0	33
2 - 0	74	6 - 8	31
2 - 4	68	7 - 0	29
2 - 8	63	8 - 0	26
2 - 12	59	9 - 0	24
3 - 0	55	10 - 0	22
3 - 4	52	12 - 0	19

THE *weights*, in the firſt, third, fifth, and ſeventh columns of the table, may either reſpect a *ſpyndle*, or any other given number of threads of a determinate length: however, to avoid confuſion, it may be convenient to reſtrict them to *ſome one denomination* of yarn; and, in this country, a ſpyndle may be referred to with as much propriety as any other.

THE numbers, ſet oppoſite to the weights, in the ſecond, fourth, ſixth, and eighth columns, are called *ſymbols of reeds;* becauſe they have the ſame *habitude* to one another, which, upon the principles above laid down, ought to ſubſiſt among reeds, of any given dimenſion, that are proper

ſor making yarns of thoſe weights, reſpectively, into any one ſpecies of cloth. And, in every caſe, in conſequence of this analogy between the reeds and ſymbols, ‘ the
‘ number of the reed known will be to
‘ the number of the reed ſought; as the
‘ ſymbol oppoſite to the weight of the
‘ yarn, the reed for which is known, is to
‘ the ſymbol oppoſite to the weight of the
‘ yarn, the reed for which is ſought.’

In other words, whatever part, or multiple, the number of the reed known is of the ſymbol oppoſite to the weight of the yarn, the reed for which is known; ſuch part, or multiple, will the number of the reed ſought be of the ſymbol oppoſite to the weight of the yarn, the reed for which is ſought.

Hence, if the proper reed be given for making, into *any one* ſort of cloth, yarn of *any one* of the weights noted in the table, a ſleying-table for making yarn of *every* weight noted in *it*, into that ſame ſort of cloth, may be conſtructed with the greateſt facility. For, if the number of the reed known be divided by the ſymbol, oppoſite to the weight of the yarn, the reed for which is known; and each of the ſymbols in the table be *ſeverally* multiplied by the quotient; the products, when ſubſtituted in the place of the ſymbols from which they are derived, will conſtitute a ſleying-table for the kind of cloth condeſcended on.

For inſtance. If it ſhould be found, hat yarn, weighing 5 ounces per ſpyndle, s properly ſleyed for *gauze*, by two hreads in each interval of a reed which ontains 900 intervals in 37 inches*: Let he number of the reed known, 900, be diided by the ſymbol oppoſite to 5 oz. 300, he quotient will be 3: and the ſymbols oppoſite to the other weights in the table, when multiplied by 3, will be the numbers of reeds, upon the ſame dimenſion, that ought to be employed in making yarn of thoſe weights *reſpectively* into gauze.

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* It is by no means intended, that the *data*, in his and the following examples, ſhould be conſiered as ſtandards, or patterns for imitation: evey manufacturer will, no doubt, ſley high or low, s his own fancy leads him; or as the taſte of his uſtomers directs him. It is ſufficient that thoſe *ata* have any degree of probability; as all that is eant, by theſe examples, is to point out the *meod of forming ſleying-tables*, from the table here iven.

THUS the ſymbol oppoſite to 11 oz. being 166, when multiplied by 3

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makes 498; which is the number of the reed, upon 37 inches, that ought to be employed in making yarn weighing 11 oz. per ſpyndle into gauze [*]. And ſo for the reſt.

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[*] It will frequently happen, that the reed, as in this caſe, will turn out to be of a number for which reed-makers have no exact *gauge*: in thoſe caſes, the neareſt *gauge-number* ought to be taken;

AGAIN: If yarn, weighing 8 oz. per ſpyndle, be properly ſleyed for linen, by two threads in each interval of a reed containing 2100 intervals in 40 inches: when the number of the reed, 2100, is divided by the ſymbol oppoſite to 8 oz. 210; the quotient is 10: by multiplying, then, each of the ſymbols by 10, the table is converted into a ſleying-table for linen.

THIS ſeems to need no illuſtration; as the placing a cypher, on the right-hand

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as in the preſent caſe, 500 in place of 498. Such ſmall deviations from mathematical preciſion will have no ſenſible effect upon the fabric of cloth.

of each of the ſymbols, exemplifies the whole.

In like manner: if yarn, weighing 8 $\frac{1}{2}$ oz. per ſpyndle, requires to be ſleyed for ſubſtantial *table-damaſk*, by four threads in each interval of a reed which has 1220 intervals in 37 inches: the number of the reed, 1220, when divided by the ſymbol oppoſite to 8 $\frac{1}{2}$ oz. or 8 oz. 8 dr. yields 6.1 for the quotient: the ſymbols, then, when *ſeverally* multiplied by that quotient, will become the numbers of the reeds, proper for making yarn of the weights oppoſite to them, into ſubſtantial table-damaſk; provided always that the yarns be ſleyed by four threads into each interval of their reſpective reeds.

Thus the ſymbol oppoſite to 22 oz. or 1 ℔ 6 oz. being 98, when multiplied

by 6.1

98

588

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will be 597.8, the number of the reed for making yarn weighing 22 oz. per ſpyndle into table-damaſk *.

After the ſame manner, and with

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* According to the preceeding note, the number of the reed may be 600 in place of 597.8.

equal facility, may a ſleying-table for any other ſort of cloth be compoſed: and thus the foregoing table, though calculated for no particular kind of cloth, may ſerve as a *matrice* of ſleying-tables for cloths of every *poſſible* kind.

HOWEVER, it may not be amiſs to take notice, that, when the proper reed is known for making yarn of any one degree of fineneſs into any of the more ſubſtantial cloths; although every *coarſer* yarn may, without limitation, be made into cloth of a ſimilar fabric, yet, every *finer* yarn cannot be made into cloth of a like fabric. The reaſon is this. Nothing hinders but that, in any reed, each of the ſplits, or partitions, may be *increaſed in thickneſs*, in proportion as the number of the reed *decreaſes*; and thereby the ſame *ratio* preſerved between the thickneſs of the partitions, and the wideneſs of the intervals: and, conſequently, there can be nothing to obſtruct any regular method of ſleying in having its *full* effect. But to *leſſen* the thickneſs of the ſplits in proportion as the number of the reed *increaſes*, and thereby to preſerve the ſame *ratio* between the intervals and ſplits, will, in many inſtances, be inſuperably difficult. Thus each of the ſplits of a reed N° 1000, upon 40 inches, may eaſily be made twice the thickneſs of each of thoſe of a reed N° 2000, upon the ſame dimenſion; but to make a reed Nº 4000, upon 40 inches, fit for uſe, and with each of its ſplits one half the thickneſs of each of thoſe of the reed Nº 2000, will be found altogether impracticable. For, beſides the difficulty of making, and adjuſting partitions ſo very minute, ſplinters of cane, when cut down to ſuch a degree of ſlenderneſs, will be incapable of ſuſtaining the ſhock in driving up the weft: and were the partitions of ſuch a reed to be made of *ſteel*, or any other hard metal, capable of the needful reſiſtance, the extreme thinneſs of theſe partitions would render them equally keen and deſtructive with ſo many edge tools. Here, now, is a natural, and an unſurmountable bar to the making *very fine* yarns into *very ſubſtantial* cloths: and hence aroſe the difference in *fabric* between the manufactures of HOLLAND, and thoſe of CAMBRAY.

IT is a collateral evidence of the *rightneſs* of this ſcheme, that the genuine effects of it are never interrupted, till, *by varying the proportions of things* *, its principles are deſtroyed.

AFTER all, it muſt be acknowleged, that, though the method here preſcribed be mathematically juſt, and the ingenious manufacturer be no longer left, *in the matter of ſleying*, to the uncertainty of conjecture, there is, nevertheleſs, the higheſt expediency for that ſort of ſkill which experience alone can teach; and for care and diligence in the application of it. For, be *theory* as it will, it is too often found in *practice*, that yarns of the ſame fineneſs are ſpun from materials, which, though the ſame in kind, are of very different complexions: and, not unfrequently, yarns of every degree of fineneſs are to be met with, diſproportionately compreſſed in the ſpinning, through exceſs, or defect of twine. It will, therefore, require the aſſiduous care of a ſkilful tradeſman accurately to diſtinguiſh yarns according to *the quality of the materials* of which they are compoſed, and *the degree of compreſſion* to which they have been ſubjected; as, to their diſſimilarity, in theſe reſpects, is owing, in a great meaſure, the imperfection of the product of the loom.

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* This may, ſometimes, be occaſioned by the inadvertency of reed-makers; and, at other times, it may be owing to phyſical impoſſibility.

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THE END.

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